USER'S OPERATING MANUAL FOR PID DIGITAL TEMPERATURE CONTROLLER

(Models: Nx - 462 / 762 / 962)

Nx - 462
(48 X 48)

Nx - 762
(72 X 72)

Nx - 962
(96 X 96)

SPECIFICATIONS : -

1. **DISPLAY TYPE** : 3 - Digit 7 segment LED

Model No.	Nx-462	Nx-762	Nx-962	Display Colour
Display height (PV)	0.39"	0.56"	0.80"	White
Display height (SV)	0.36"	0.39"	0.56"	Green

2. **STATUS LED'S** : OP1 : Control Output Status
   AL1 : Alarm1 Status
   AL2 : Alarm2 Status
   AT : Tune Status

3. **INPUT**
   Sensor input : TC:J,K & RTD Pt-100
   Range : Refer below Table.

Sensor Type	Range	Resolution	Accuracy
Fe-k(J) T/C	0 ~ 760°C	1 °C	± 1 °C
Cr-AL(K) T/C	0 ~ 999°C	1 °C	
Pt-100(RTD)	-99 ~ 450°C	1 °C	

   Sampling Time : 125 msec.
   Resolution : 1°C
   CJC for TC : Built in automatic
   LWC for Pt-100 : Built in up to 18E max.
   Digital Filter : 1 to 10 Sec.

4. **RELAY OUTPUT**
   Contact type : N/O, COM
   Contact Rating : 5A @ 250VAC or 30 VDC
   Life expectancy : > 5,00,000 operations
   Isolation : Inherent

5. **SSR DRIVE OUTPUT**
   Drive Capacity : 12V @ 30mA.
   Isolation : Non-Isolated.

6. **FUNCTION**
   Output 1 : Main Control output (Factory Set)
   1) Relay
   2) SSR
   3) mA (4~20 / 0~20)
   Output 2 : Programmable
   1) Auxiliary control
   2) Alarm
   3) None

   Control Action : ON-OFF/PID (Select)
   Control Mode : Heat/Cool (Select)

7. **ENVIRONMENTAL**
   Operating Range : 0 ~50°C, 5~90% Rh
   Storage Humidity : 95% Rh (Non-condensing)

8. **POWER SUPPLY**
   Supply Voltage : 90~270VAC, 50/60Hz.
   Consumption : 4W Maximum.

9. **PHYSICAL**
   Housing : ABS Plastic

INSTALLATION GUIDELINES

1. Prepare the cut-out with proper dimension as shown in figure.
2. Remove clamp from Controller.
3. Push the Timer through panel cut-out and secure the Controller in its place by tightening the side clamp.

SAFETY INSTRUCTION

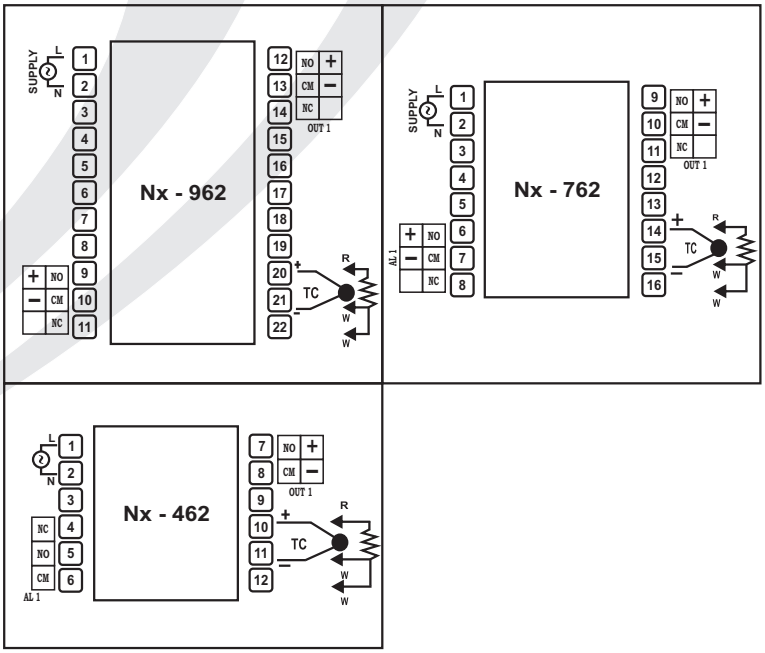
MECHANICAL

❖ Ambient temperature and relative humidity surrounding the Controller must not exceed the maximum specified limits.
❖ The Controller in its installed state must be protected against excessive electrostatic or electromagnetic interferences.

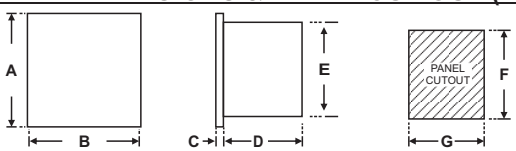
ELECTRICAL

❖ The Controller must be wired as per wiring diagram & it must comply with local electrical regulation.
❖ The Electrical noise generated by switching inductive loads might create momentary Fluctuation in display, latch up, data loss or permanent damage to the instrument. To reduce this use snubber circuit across the load.

TERMINAL CONNECTIONS :

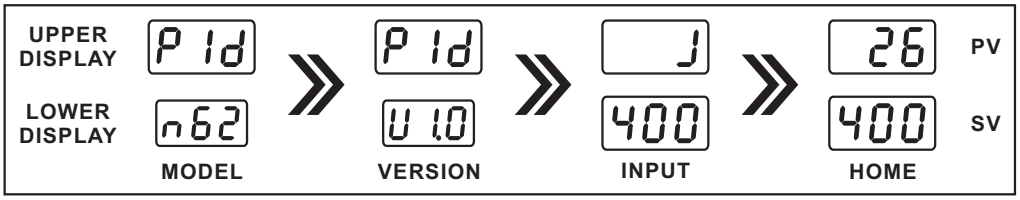


OVER ALL DIMENSIONS & PANEL CUT OUT (IN MM)



Dim / Model	A	B	C	D	E	F	G
Nx - 962	96	96	14	80	90	92	92
Nx - 762	72	72	14	80	70	68	68
Nx - 462	48	48	14	86	44	44	44

POWER UP: At power on, following sequence will be prompted on the display till it reaches to Home display mode.



PROGRAMMING

RUN MODE : To access the run mode Press UP, Down and SHIFT key to change SP1

Para meter	Lower Display	Upper Display	Range	Description	Default
Control Set Point	SP1	0	LSPL~HSPL	User can change the SP value using UP/DOWN and SHIFT keys. Holding the key will change the value at a faster rate. Press SET key to store the desired value.	0°C

USER LIST : To access the user list Press & Release SET key once.

Para meter	Lower Display	Upper Display	Range	Description	Default
Set Point 2	SP2	0	LSPL~HSPL -99 to 99 °C 2 to 99 °C	This parameter will be prompted if Output 2 is configured as... (1) Either absolute auxiliary control or as an alarm (High/Low) mode. (2) Either deviation auxiliary control or as a deviation alarm mode. (3) As a band alarm (For all above SP2 has to be enabled.)	0°C
Ramp Rate	r.rt	5.0	0.0 °C to 25.0 °C	This parameter will be available only, if Enabled in Configuration List. User can set ramp rate/min for SP1 (Set Point) to minimize overshoot.	Disable
Manual Power	P.mn	50	0 % to 100 %	This parameter will be prompted only, if Manual power is enabled from Control List. Manual Power means that the controller output power can be adjusted directly by the user.	50 %

CONTROL LIST : To enter in this mode press SET & DOWN key simultaneously for 3 sec.

Para meter	Lower Display	Upper Display	Range	Description	Default
Lock Code	LCK	0	1 ~ 999	Set this parameter to 15 (Default LOCK CODE) to access Control List. User has a choice to set different Lock Code via USER LOCK CODE in Config. List.	15
Proportional Band	Pb	5.0	0.5 to 99.9°C	This parameter will be prompted only, if selected control action is PID. It sets bandwidth over which the output power is adjusted depending upon the error (SV-PV). The value of this parameter is automatically set by Auto tune function.	5.0°C
Integral Time	Int	240	0 to 999 Sec.	This parameter will be prompted only, if selected control action is PID. It sets the time taken by PID algorithm to remove steady state error. Value of this parameter is automatically set by Auto Tune function. If set to '0', this function will be disabled.	240
Derivative TIme	dt	60	0 to 300 Sec.	This parameter will be prompted only, if selected control action is PID. It defines how strongly the controller will react to the rate of change of PV. Value of this parameter is automatically set by Auto Tune function. If set to '0', this function will be disabled.	60
Cycle Time	Ct	16.0	0.5 to 99.9 Sec.	This parameter will be prompted only, if selected control action is PID. User can set this value based on process being controlled & type of output being selected. For Relay O/P, cycle time should be more than 12sec & for SSR O/P, cycle time should be less than 10sec.	16.0 sec.
Manual Power	P.mn	YES / nO		This parameter will be prompted only, if factory set control output is "mA" If "Yes" selected, Output power will be adjusted by user from User List. If "No" selected, Output power will be adjusted by instrument itself as per PID routine.	NO
Output Power Limit	OPH	100	0 % to 100 %	This parameter will be prompted only, if selected control action is PID. This parameter will decide the maximum output power in % applied to the load.	100 %
Soft Start Time	S.tm	50	5 sec. to 300 sec.	This parameter will be prompted only, if factory set control output is "mA". The soft start function suppresses the mA to become max. output. It places an upper limit on mA output for a specified amount of time after power on. This function is useful for effects such as suppressing the heater output during equipment startup & make load lightened. After the time has passed, the soft start function ends & normal PID control begin.	50 sec.

Para meter	Lower Display	Upper Display	Range	Description	Default
Output Off	0.0F	dSb	1 to 10	This parameter will be prompted only if selected control action is PID. With this parameter, O/P will be completely OFF after the Set Point + Offset Value. If Disabled, O/P will act depending upon the PID value after Set Point achieved.	Disable
Tune Offset	t.oF	100	50 % to 100 %	This parameter will be prompted only, if selected control action is PID. This parameter allows the User to carry out Auto Tuning function below the set point. (If Tune offset is 50% tuning will be carried out at 50% of the set point and if 100% tuning will be carried out at 100% of the set point.	100 %
Control Hys. 1	HY1	2	1 to 25 °C	This parameter will be prompted only, if selected control action is ON-OFF. It sets the dead band between ON & OFF switching of the output. Larger value of hysterisis minimize the number of ON-OFF operation of load. This increases life of actuators like contactors but also produces large errors (between PV & SV).	2°C
Delay 1	dL1	0	0 to 500 sec.	This parameter will be prompted only, if selected control action is ON-OFF. It sets the main output restart where O/P once turned OFF will turn ON only after restart time, regardless difference between PV & SP in Heat or Cool mode. If set to '0', O/P will be switched without delay. Also, delay will be applicable in case of every power ON.	0 sec.
Hys. 2	HY2	2	1 to 25 °C	This parameter will be prompted only, if selected control mode for output2 is auxiliary control or an alarm. The value of this parameter sets the dead band between on and off switching of output load.	2°C
Delay 2	dL2	0	0 to 500 sec.	This parameter will be prompted only, if output 2 is configured as an Auxiliary control output. In this mode, O/P once turned OFF will restart only after set time regardless of the difference between PV and SP2. Time delay is settable up to 500 seconds. If time delay is set to 0, there is no delay between output switching.	0 sec.

CONFIGURATION LIST :

(1) To enter in this mode, Press and hold SET & UP key simultaneously for 3 sec.
(2) Press UP or DOWN key to scroll between parameter options.
(3) Press SET key to store the current parameter & move on to the next parameter.

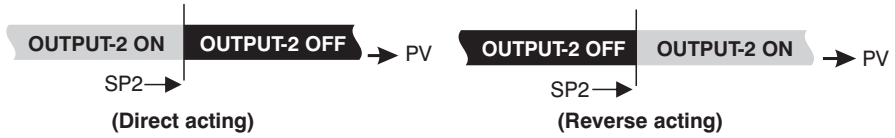
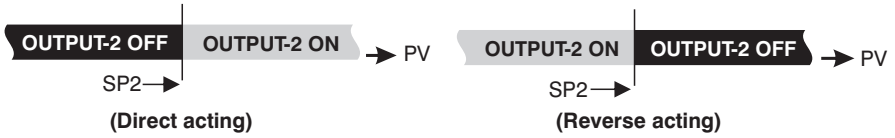
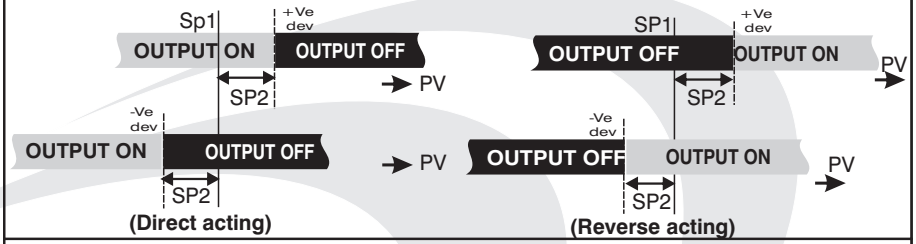
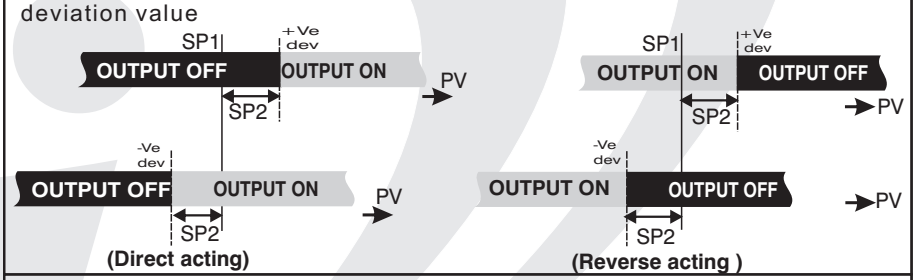
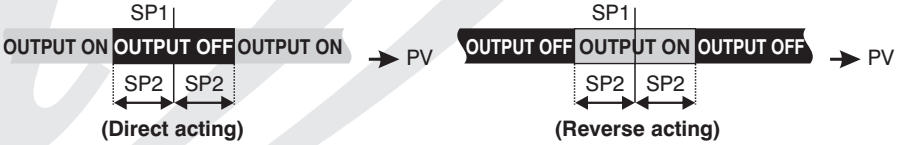
<table>
<tr><th>Para meter</th><th>Lower Display</th><th>Upper Display</th><th>Description</th><th>Default</th></tr>
<tr><td>Lock Code</td><td>LCP</td><td>0</td><td>Set this parameter to 15 (Default LOCK CODE) to access Config. List.
User has a choice to set different Lock Code between 1 to 999 via USER LOCK CODE in Config. List.</td><td>15</td></tr>
<tr><td>Input Type</td><td>InP</td><td>J
P
Pt</td><td>This parameter value is set according to the type of sensor (Thermocouple or RTD input) connected to the controller's input terminals.
<table>
<tr><th>Sensor Type</th><th>Range</th><th>Resolution</th><th>Accuracy</th></tr>
<tr><td>Fe-k(J) T/C</td><td>0 ~ 760°C</td><td>1 °C</td><td rowspan="3">± 1 °C</td></tr>
<tr><td>Cr-AL(K) T/C</td><td>0 ~ 999°C</td><td>1 °C</td></tr>
<tr><td>Pt-100(RTD)</td><td>-99 ~ 450°C</td><td>1 °C</td></tr>
</table></td><td>J</td></tr>
<tr><td>mA Output Type</td><td>OPt</td><td>0.20
4.20</td><td>This parameter will be prompted only, if factory set control output is “mA”.
If “0~20" selected, Control Output will be 0~20mA.
If “4~20" selected, Control Output will be 4~20mA.</td><td>4~20 mA</td></tr>
<tr><td>mA Low Calibration</td><td>CLO</td><td>16.7</td><td>This parameter will be prompted only, if factory set control output is “mA”. By this parameter, user can adjust Lower calibration for selected mA type. (Adjust 0mA on meter if 0~20 selected or 4mA on meter if 4~20 selected).</td><td>16.7</td></tr>
<tr><td>mA High Calibration</td><td>CHO</td><td>85.5</td><td>This parameter will be prompted only, if factory set control output is “mA”. By this parameter, user can adjust Higher calibration for selected mA type. (Adjust 20mA on meter with this parameter).</td><td>85.5</td></tr>
<tr><td>Lower SP Limit</td><td>LSP</td><td>0</td><td>Sets the minimum limit for set point adjustment. It can be set from minimum specified range of selected sensor to HSPL value.</td><td>0 °C</td></tr>
<tr><td>Higher SP Limit</td><td>HSP</td><td>400</td><td>Sets the maximum limit for set point adjustment. It can be set from LSPL value to maximum specified range of selected sensor.</td><td>400 °C</td></tr>
</table>

Para meter	Lower Display	Upper Display	Description	Default
Process Value Offset	OFS	0	Function of this parameter is to add/subtract a constant value to the measured PV to obtain final PV for control applications. This parameter value can be altered : (1) To compensate for known thermal gradient. (2) To match the display values with another recorder or indicator measuring the same PV.	**0 °C**
Input Filter	FLt	1	The controller is equipped with an adaptive digital filter which is used to filter out any extraneous pulses on the PV. The filtered PV value is used for all PV dependent functions. If the PV signal is fluctuating due to noise, increase the filter time constant value.	**1**
Control Mode	CtL	PId OnF	User can select between PID or ON-OFF action algorithm to be adopted for output. If Factory Set Control output is “mA”, then Control mode as PID selected & this parmeter will be skipped.	**PID**
Control Logic For Output 1	O1.L	Ht CL	This parameter will be prompted only, if selected control mode is ON-OFF. User can select heating logic in which OP1 will remain ON till PV < SP. (PV increases when output is ON). This parameter will appear only, if selected control mode is ON-OFF. User can select cooling logic in which OP1 will remain ON till PV > SP. (PV decreases when output is ON).	**Heat**
Over shoot Control Point	OCP	dSb	This parameter will be prompted only, if selected control action is PID. Setting this parameter on higher side will proportionally slow down the rate of rise of PV to minimize overshoot (this may cause delay to reach SP). Disabling or Setting this parameter on lower side will proportionally increase the rate of rise of PV (which may cause overshoot). Disable this option if delay is not required to reach SP. (This may cause overshoot w.r.t SP)	**50%**
Ramp Rate	r.rt	Enb dSb	User can set the desired RAMP rate in USER list. The RATE parameter will not be prompted in USER list.	**Disable**
Output 2 Function	OP2	AUC ALn non	This parameter allows the user to select output 2 as an ‘Auxiliary’ control. For options refer Table 3. This parameter allows the User to select output 2 as an ‘Alarm’ control. For options refer Table 4. If this parameter is selected, then output 2 will be off.	**Aux**

TABLE 3 : Below listed options will appear only if OP2 is selected as an Auxiliary control mode.

Para meter	Lower Display	Upper Display	Description	Default
OP 2 Mode	SP2	AbS dEu	This parameter will be prompted only, if Output 2 is selected as an Auxiliary control output. In this mode, User can set SP2 value independently. The instrument works as 2-Set point controller. This parameter will be prompted only, if Output 2 is selected as an Auxiliary control output. In this mode, User can set Sp2 value which is always related to SP. User can set Sp2 value with the deviation of ± 99°C w.r.t SP.	**Abs**
OP 2 Logic	O2.L	Ht CL	User can select heating logic in which OP2 will remain ON till PV < SP2. (PV increases when output2 is ON). User can select cooling logic in which OP2 will remain OFF till PV < SP2. (PV decreases when output2 is ON).	**Heat**

TABLE 4 : Below listed parameters will appear only if OUTPUT 2 is selected as ALARM mode. In ALARM mode, Controller continuously compares PV with either SP (for Deviation or Band alarm) or an independent ALARM Sp2 (for process high and process low Alarm).

Para meter	Lower Display	Upper Display	Description	Default
Alarm Type	A.tY	Lo	Low Alarm : OP2 activates when PV<SP2.  	**High Dev.**
		Hi	High Alarm : OP2 activates when PV>SP2.  	
		L.du	Low Deviation Alarm : OP2 activates when PV is less than SP1 ± set deviation value  	
		H.du	High Deviation Alarm : OP2 activates when PV is greater than SP1 ± set deviation value  	
		bnd	Band Alarm : OP2 activates when PV falls outside the band w.r.t. SP1 in either direction.  	
Alarm Logic	A.LG	dIr	If this parameter is set as 'Direct', Relay/SSR energizes under Alarm condition & remains De-energized otherwise. 'Direct' setting is generally used for Audio/Visual Alarm Output.	**Direct**
		rEu	If this parameter is set as 'Reverse', Relay/SSR De-energizes under Alarm condition & remains energized otherwise. 'Reverse' setting is generally used for tripping the process under Alarm condition.	
Alarm Inhibit	A.IH	YES	This parameter can be used to inhibit (suppress) the Alarm activation upon power-up conditions by setting the parameter value to 'YES". From Power-up, the Alarm system remains disabled until PV is found with in the limits.	**No**
		nO	If Alarm activation is desired even under Power-up condition, Set this parameter value to 'NO'.	
Alarm Ack.	A.AY	AU	Once Alarm is activated, user has following three options to de-activate it. When PV falls within the programmed limits, Alarm will be de-activated automatically.	**Auto**
		nAn	Once Alarm is activated, it remains activated until manually acknowledged by UP key.	
		btH	Once Alarm is activated, it can be de-activated either by pressing UP key or when PV falls within the alarm limits.	

SUPERVISORY PARAMETERS : To enter in this mode, Press & hold SET key for minimum 3 sec.

Parameter	Lower Display	Upper Display	Description	Default
Lock Code	LCK	0	Set this parameter to 7 (Default LOCK CODE) to access set points.	7
Set Point 1	SP1	Enb ⌄ ⌃ dSb	If Enabled, User can View & edit the Set point (SP1) in USER list. If disabled, User can not View or edit Set Point (SP1) in USER list.	Enable
Set Point 2	SP2	Enb ⌄ ⌃ dSb	If Enabled, User can View & edit the Set point (SP2) in USER list. If disabled, User can not View or edit Set Point (SP2) in USER list.	Enable
Auto Tune	At	Enb ⌄ ⌃ dSb	This parameter will be prompted only if selected control action is PID. If Enabled, this parameter will be prompted if user press Shift key for 3Sec. If Disabled, this parameter will not be prompted if user press Shift key for 3Sec.	Enable
mA Default	d.nA	YES ⌄ ⌃ nO	This parameter will be prompted only if factory set control output is “mA”. If “Yes" Selected, User Calibration will be replaced with Factory Calibration. If “No" Selected, No change in User Calibration.	No

AUTO TUNING MODE : To enter in this mode, Press & hold SHIFT key for minimum 3 sec.

Parameter	Lower Display	Upper Display	Description	Default
Auto Tuning Mode	At	YES ⌄ ⌃ nO	This function will be executed only if selected control action is PID. Auto-tuning function is enabled by setting this parameter to ‘YES’. The decimal of LSB flashes till Auto tuning function is in progress. During Auto-tuning, Controller learns the process characteristics by itself & calculates required P, I & D values. User can cancel or abort this feature by setting this parameter to ‘NO’.	No

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